United States Patent [19]

Ogura

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[54] **MARKING APPARATUS**

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[73] Assignee: **Yoshido Kogyo K.K.**, Tokyo, Japan

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[30] **Foreign Application Priority Data**

Aug. 10, 1987 [JP] Japan ..... 62-122400[U]

[51] **Int. Cl.**[4] **B32B 31/18**

[52] **U.S. Cl.** **156/378;** 156/64; 156/261; 156/518; 156/519; 156/530; 73/865.9

[58] **Field of Search** 156/261, 518, 519, 530, 156/64, 378, 379; 73/865.9

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Primary Examiner—Caleb Weston

Attorney, Agent, or Firm—Hill, Van Santen, Steadman & Simpsom

[57] **ABSTRACT**

A marking apparatus is disclosed for cutting a piece out of an adhesive tape and simultaneously attaching the same onto and individual slide fastener which has been found defective during the travel of a continuous slide fastener chain. The apparatus is operatively associated with a detecting device which controls the operation of an air cylinder so that a cutting punch is reciprocated toward and away from an anvil and a support mandrel.

5 Claims, 5 Drawing Sheets

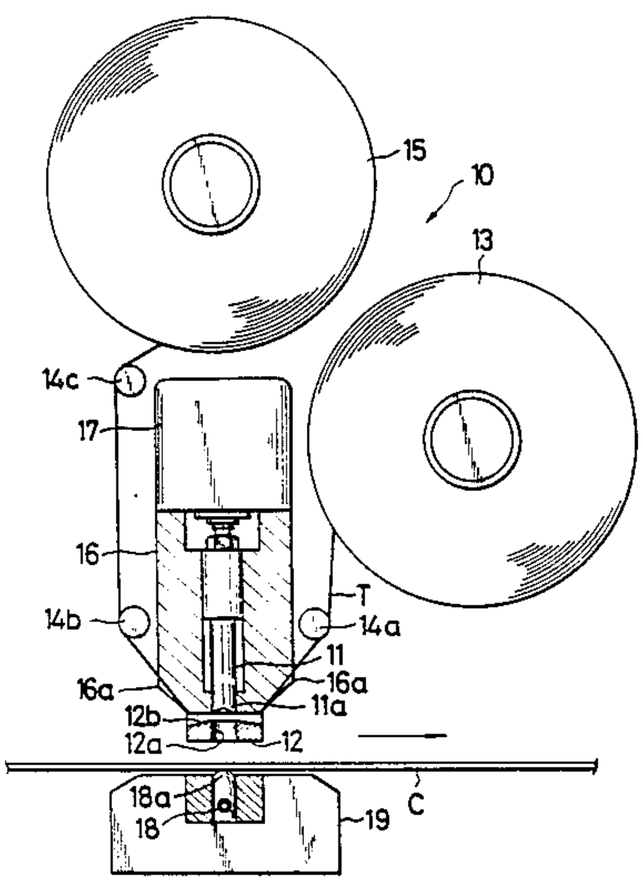


FIG. 1

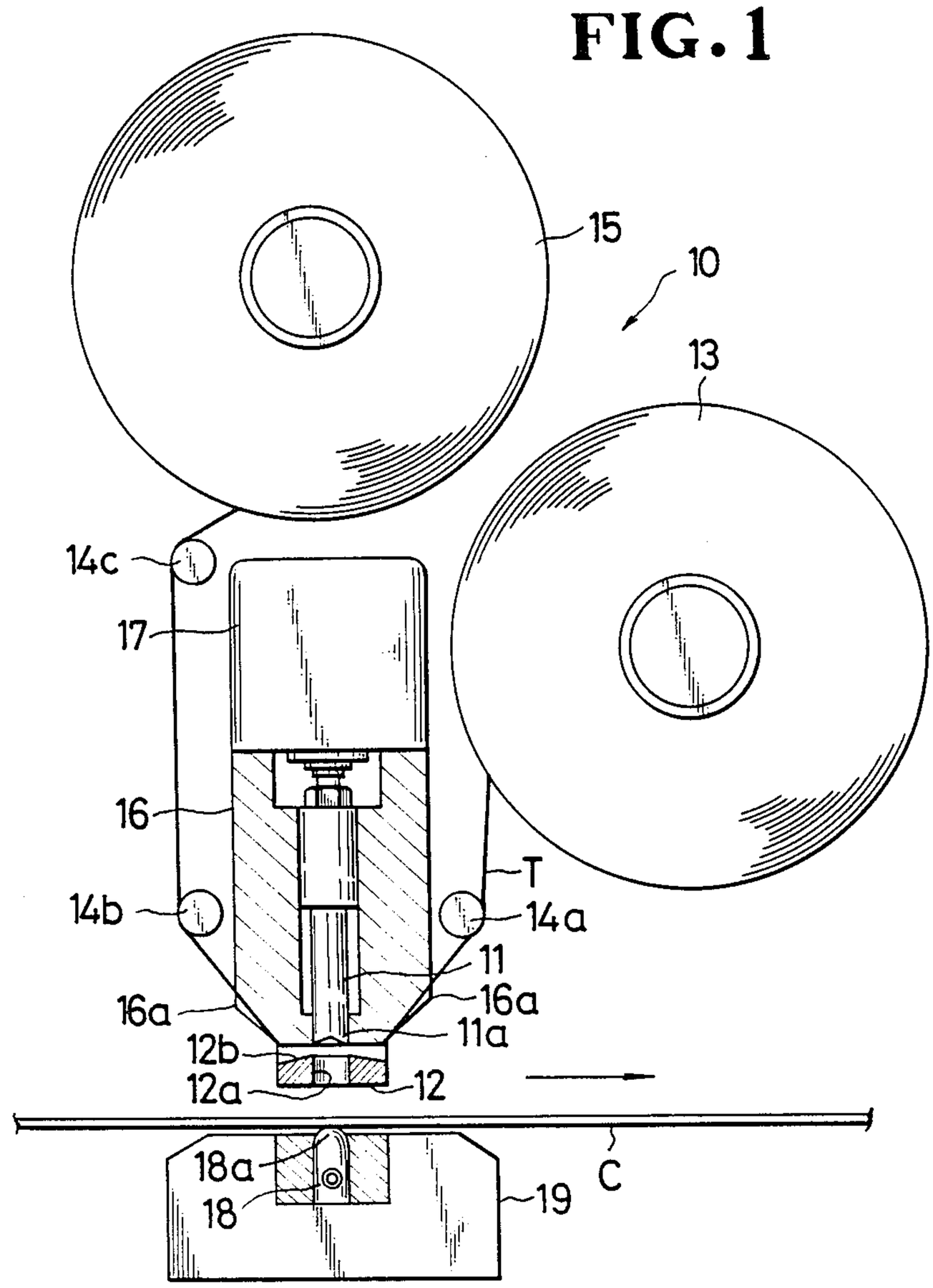


FIG. 2

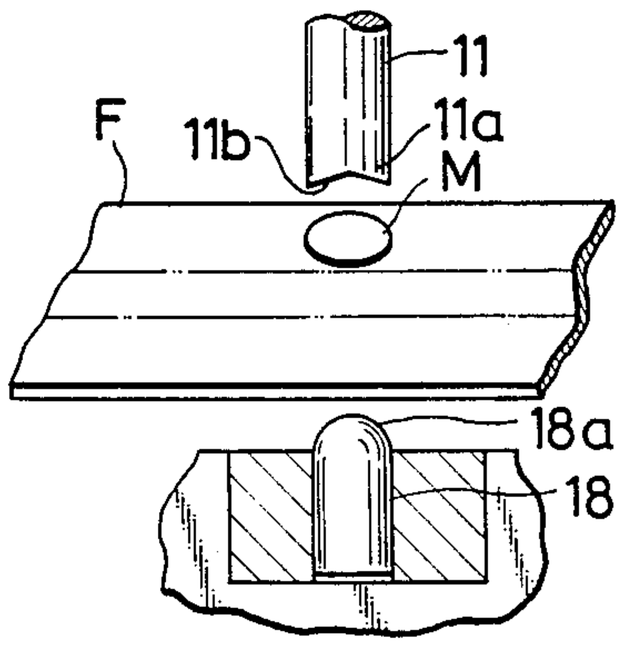


FIG. 3A

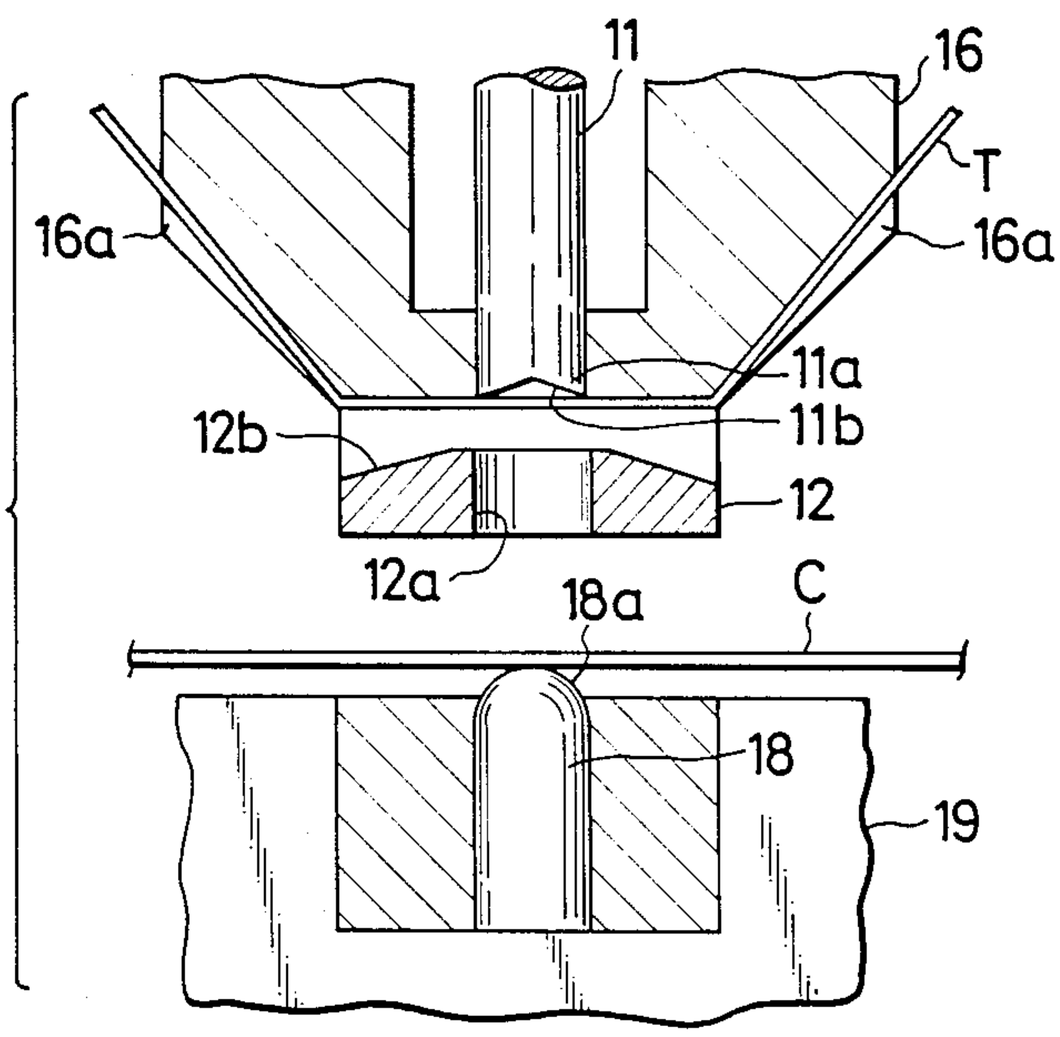


FIG. 3B

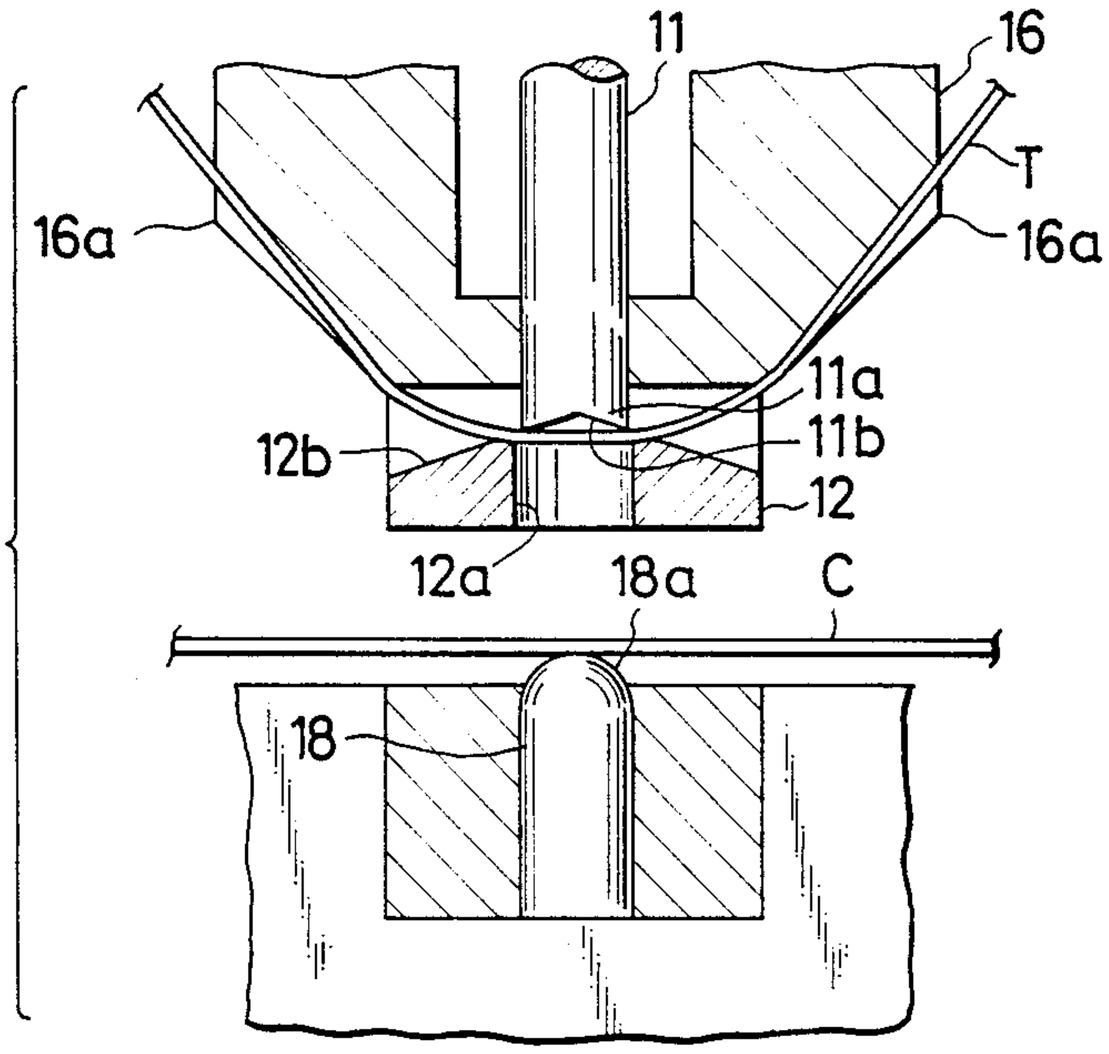

11
16
T
16a
16a
11a
11b
12b
12
12a
18a
C
18

FIG. 3C

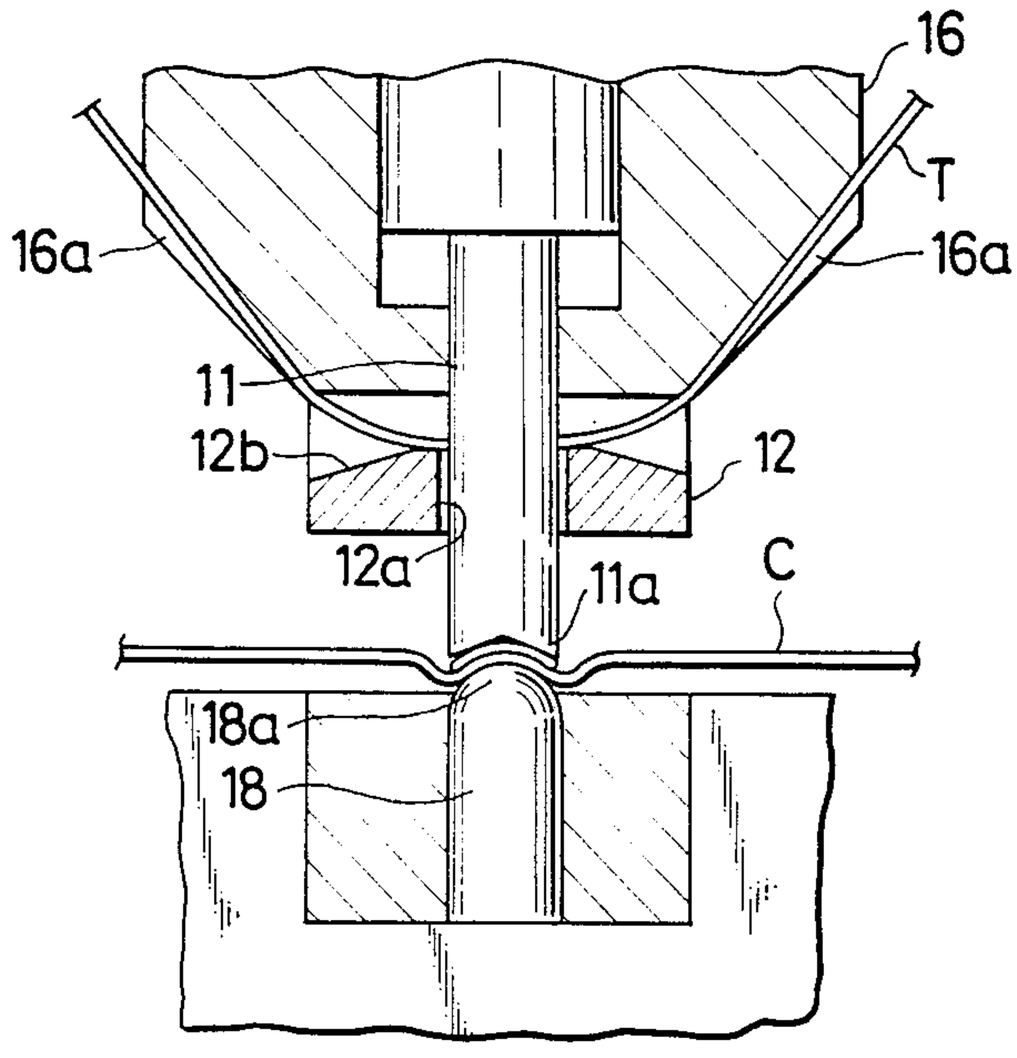

16
T
16a
16a
11
12b
12
12a
11a
C
18a
18

FIG. 3D

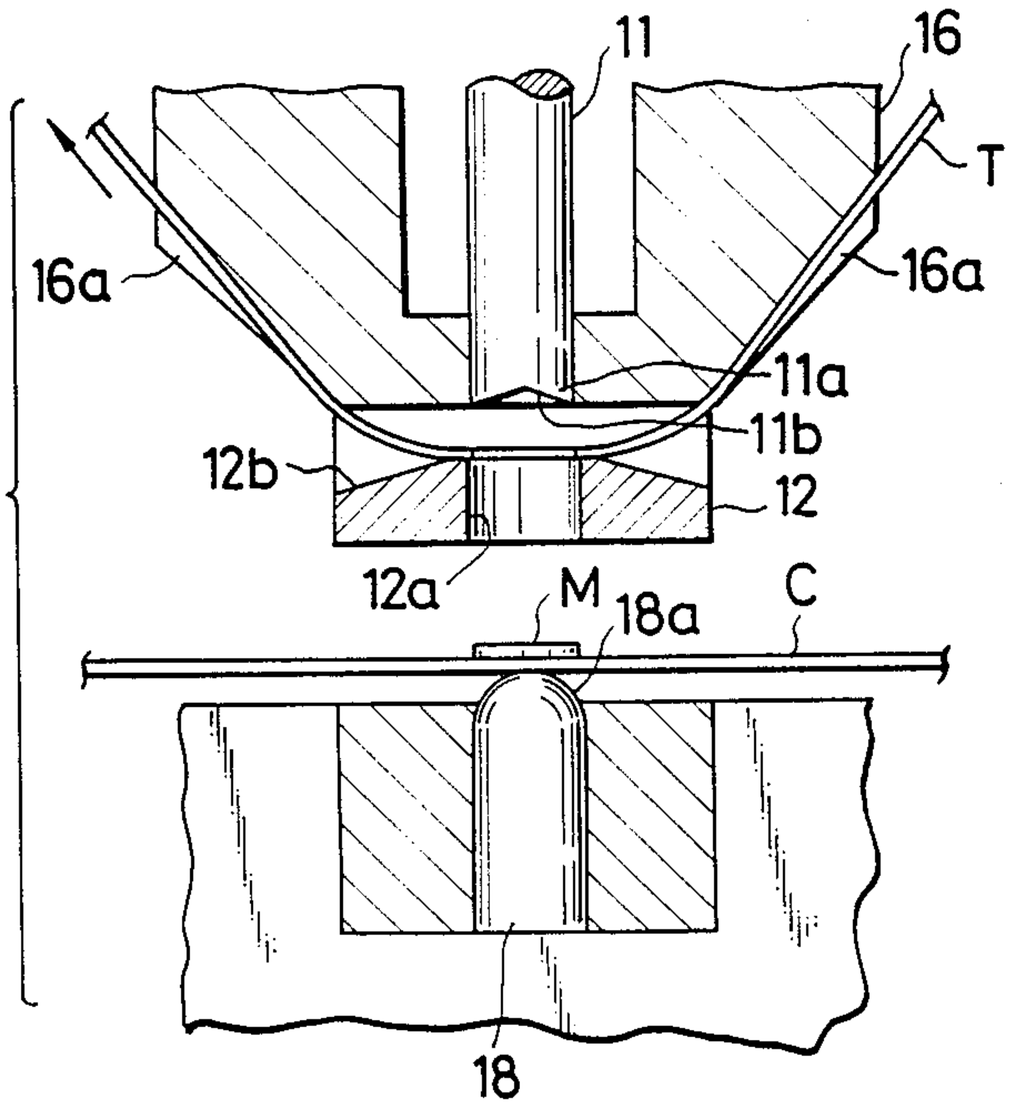
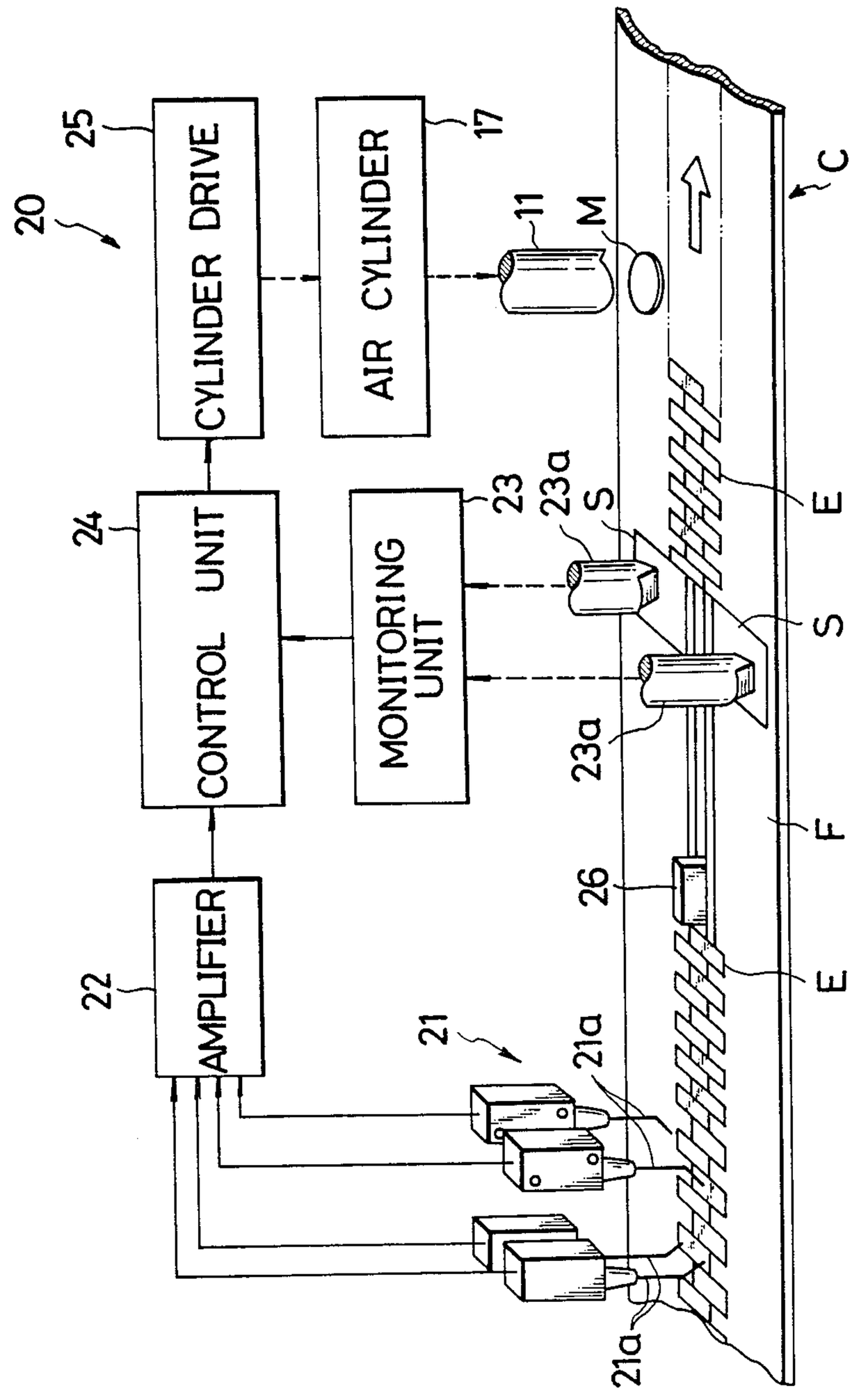

11
16
T
16a
16a
11a
11b
12b
12
12a
M
18a
C
18

FIG. 3E

11
16
T
16a
16a
11a
11b
12b
12
C
12a
18a
M
18

FIG. 4


20
25
CYLINDER DRIVE
17
AIR CYLINDER
11
M
C
24
CONTROL UNIT
MONITORING UNIT
23
23a
S
E
S
23a
F
26
E
22
AMPLIFIER
21
21a
21a

MARKING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a marking apparatus for identifying a slide fastener chain when found defective during the course of its manufacture.

2. Prior Art

There have hitherto been proposed apparatus and instruments for inspecting a continuous slide fastener chain for any physical defects to be corrected before shipment as a complete slide fastener product. One such apparatus is disclosed in Japanese Laid-Open Patent Publication No. 61-94606 in which assembled slide fasteners are hung against an inspection panel and checked by observation with the human eyes to be sorted out if found defective anywhere, and in which a gilted tape is used to show the joints of adjacent slide fastener chains.

The visual inspection of fastener products as in the above prior art must eventually be followed up by an additional more fine inspection to ensure freedom of defects or off-specification finishes of the final product because of possible inadvertent oversights by fatigued or inexperienced working personnel. This problem is pronounced where the job attendant is required to check errors in small parts such as fastener coupling elements. Not only is such a conventional human performance time-consuming but it is not wholly reliable for its results.

SUMMARY OF THE INVENTION

It is therefore the primary object of the present invention to eliminate the foregoing difficulties and drawbacks of the prior art.

A more specific object of the invention is to provide an apparatus for marking a slide fastener chain when found defective which is simple in construction and highly reliable in operation, the apparatus being operatively associated with an automatic defect detecting device.

Another specific object of the invention is to provide a marking apparatus capable of applying an indicia removably to a selected area on defective slide fastener chain without impairing the latter.

A further specific object of the invention is to provide a marking apparatus capable of punching out and simultaneously applying an indicia to defective slide fastener chain in response to a control signal from an automatic defect detecting device.

According to the invention, there is provided a marking apparatus for identifying defective slide fasteners in a continuous fastener chain which comprises: a cutting punch having a blade and pneumatically actuated to vertically reciprocate to and from an operative position; a cutting anvil having a bore for receiving said blade; a support mandrel located under and in alignment with said cutting punch; and a plurality of guide rolls for guiding an adhesive tape between a supply reel and a take-up reel, characterized in that said cutting punch cuts a piece out of said adhesive tape and simultaneously transfers the same onto said fastener chain in a single one-way stroke.

The above and other objects and advantages of the present invention will be better understood from the following detailed description taken in connection with the accompanying drawings in which like reference

numerals refer to like or corresponding parts throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevational, partly sectional, view of a marking apparatus embodying the invention;

FIG. **2** is a perspective view of part of the apparatus, showing an indicia attached to a slide fastener tape;

FIGS. **3A–3E**, inclusive, are cross-sectional views of an operative part of the apparatus, utilized to explain the sequence of its marking operation; and

FIG. **4** is a schematic diagram showing an automatic defect detecting device operatively associated with the apparatus of the invention and a portion of a slide fastener chain on enlarged scale.

DETAILED DESCRIPTION

Referring now to the drawings and FIG. **2** in particular, there is shown a marking apparatus **10** embodying the invention which comprises a vertically reciprocative cutting punch **11** and a stationary cutting anvil **12** coacting therewith in cutting an indicia M out of an elongate strip of adhesive tape T. The adhesive tape T is formed for example from a resinous substrate coated with suitable particulate metal, and it is fed from a supply reel **13** past guide rolls **14***a*, **14***b* and **14***c* and taken up on a take-up roll **15** mounted slightly above the supply reel **13**.

Designated at **16** is a housing in which is mounted an air cylinder **17** which is connected to and vertically reciprocates the cutting punch **11**.

The guide rolls **14***a* and **14***b* are supported in diametrically opposed relation across a lower portion of the housing **16** so that they can keep the adhesive tape T that symmetrically on opposite sides of the housing **16**. The adhesive tape T is also guided in and along guide grooves **16***a* formed obliquely in the bottom portion of the housing **16**. The grooves **16***a* are aligned with the guide rolls **14***a* and **14***b* respectively so that the adhesive tape T has a straight run therebetween. The housing **16** has a central horizontal guide surface **16***b* intermediate between the oblique guide grooves **14***a* and **14***b* and extending parallel to the plane of a slide fastener chain C travelling in the direction of the arrow.

The cutting punch **11** has a cross-sectionally round circular blade **11***a* which is peripherally recessed as at **11***b* in the form of a shallow inverted-V for purposes hereafter described.

The cutting anvil **12** is centrally provided with a bore **12***a* dimensioned to snugly receive the cutting punch **11** and has an upper surface **12***b* downwardly sloped to avoid any substantial contact with the adhesive tape T.

Designated at **18** is a support mandrel secured in a base **19** and located under and in alignment with the bore **12***a* and the punch **11**. The top end of the support mandrel **18** is rounded off to provide a substantially semi-spherical head **18***a* which serves to evade direct abutting engagement with the blade **11***a* of the cutting punch **11**.

Reference to FIG. **4** shows an automatic defect detecting device generally designated as **20** which essentially comprises a pair of fastener element monitoring units **21** each including optical fibers **21***a* disposed on each of slide fastener stringers for monitoring the fastener coupling elements E on the respective support tapes of an individual slide fastener F; an amplifier unit **22**; a reinforcing strip monitoring unit **23** including a detecting pin **23***a* disposed on each stringer half for

monitoring a reinforcing strip S at one end of each individual slide fastener F; and a control unit **24** connected to the two monitoring units **21**, **22** and adapted to actuate a cylinder drive **25** connected to the air cylinder **17**.

When either of the fastener element monitoring units **21** encounters any defective or maligned fastener elements E, it generates a signal which is amplified at the unit **22** and fed to the control unit **24**, whereupon the cylinder drive **25** is actuated to drive the air cylinder **17**. In like manner, when the reinforcing strip monitoring unit **23** detects any defective reinforcing strip S, it sends a signal to the control unit **24**, whereupon the drive **25** is turned on to actuate the air cylinder **17**. Since the detecting device **20** does not form positive part of the invention, no further description as to its details will be required.

A positioning pin or stopper **26** is employed to stop the travel of the fastener chain C at predetermined intervals in a manner well known in the art.

Now, as and when the fastener chain C is found defective by the detecting device **20**, the air cylinder **17** makes a downward stroke to cause the cutting punch **11** to cut a piece out of the adhesive tape T and transfers the same onto either tape half of the fastener F. This operation is depicted in FIG. **3**, in which FIG. **3A** shows the punch **11** retracted away from the coacting anvil **12** and with its blade **11***a* immediately above the uncoated side of the adhesive tape T; FIG. **3B** shows the punch **11** urging the tape T into contact with the anvil **12**; FIG. **3C** shows the punch **11** as having cut an indicia M; i.e., a circular piece out of the tape T and moved past the anvil **12** into abutting relation to the support mandrel **18**, in which position the coated side of the indicia M is bonded to the slide fastener tape; FIG. **3D** shows the punch **11** retracted to the original standby position of FIG. **3A**, leaving the indicia M on the fastener tape; and FIG. **3E** shows the adhesive tape T and the fastener chain resuming their respective intermittent movement in the direction of the arrow.

The operation of the marking apparatus **10** effects both cutting and attaching of the marking indicia M substantially simultaneously through a single one-way stroke of the cutting punch **11**.

It will be understood that individual slide fasteners F severed from its continuous chain C, when marked with the indicia M, will be optically detected and further processed for the necessary corrective finish, in which instance some of such marked fasteners whose defects are negligible may be progressed as acceptable conveniently by just removing the indicia M.

Obviously, various modifications and variations of the present invention are possible in the light of the above teaching. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A marking apparatus for identifying defective slide fasteners in a continuous slide fastener chain as the slide fastener is fed longitudinally along a horizontal path, comprising:

(a) means for detecting a defective slide fastener in the slide fastener chain;

(b) a punch operating unit actuated when a defective slide fastener is detected by said detecting means;

(c) a cutting punch driven by said punch operating unit to reciprocate along a vertical path, said cutting punch having a peripheral cutting edge;

(d) at least two guide rolls disposed on opposite sides of said vertical path of movement of said cutting punch for supporting therebetween a longitudinal portion of a continuous adhesive tape, said cutting punch when driven being operative to cut a piece out of the longitudinal portion of the adhesive tape, thereby producing an indicia indicative of a defective slide fastener; and

(e) a stationary support mandrel disposed below said horizontal path of movement of the fastener chain in registry with said cutting punch for supporting said indicia between the detected defective slide fastener and said cutting punch, said support mandrel having a relieved upper surface held out of contact with said cutting edge when said indicia is supported.

2. A marking apparatus according to claim **1**, including a housing vertically reciprocally supporting thereon said cutting punch and having a horizontal guide surface for supporting thereon the longitudinal portion of the adhesive tape, and a cutting anvil disposed between said cutting punch said support mandrel and having a vertical bore for the passage therethrough of said cutting punch, said cutting anvil having a downwardly sloped upper surface confronting said horizontal guide surface of said housing.

3. A marking apparatus according to claim **2**, said housing having a pair of oblique guide grooves extending upwardly outwardly from opposite ends of said horizontal guide surface and disposed respectively in alignment with said guide rolls.

4. A marking apparatus according to claim **1**, said cutting punch having a centrally recessed lower surface, said cutting edge being formed on an outer peripheral edge of said lower surface, said support mandrel having a substantially semi-spherical head cooperative with said recessed front surface of said cutting punch in holding therebetween the indicia and the defective slide fastener.

5. A marking apparatus according to claim **4**, said cutting edge being of a circular shape and having a diametrically opposite recessed portions.

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